CONCURRENT ESTIMATION OF COCONUT PRODUCTION IN ANDHRA PRADESH

Statistics Section
Table of Contents

1 Introduction ........................................................................................................................................3
  1.1 Background ................................................................................................................................3
  1.2 Objective ....................................................................................................................................3
  1.3 Coverage .....................................................................................................................................4
  1.4 Sampling Design .........................................................................................................................4
  1.5 Sample Size ................................................................................................................................5
2 Methodology .....................................................................................................................................10
3 Survey Results & Analysis ................................................................................................................10
  3.1 Concept and Definitions .............................................................................................................10
  3.2 Formulae ....................................................................................................................................11
  3.3 Distribution of Holding Size ......................................................................................................11
  3.4 Plant Density, of Bearing & Non Bearing Palms .........................................................................11
  3.5 Yield – Palm wise and per Hectare ..........................................................................................12
4 Findings at a Glance ........................................................................................................................14
5 Data Tables .....................................................................................................................................15
6 References .......................................................................................................................................17
1 Introduction

1.1 Background

Agriculture sector contributes for about 14% of the nation’s GDP, about 11% of its exports earnings and half of the population still relies on agriculture for their employment and as its principal source of income.

Coconut palm provides food security and livelihood to a large size of population in the world, particularly in Asia Pacific Countries. Considering the versatile nature of the crop and the multifarious uses of its products, coconut palm is eulogized as KALPAVRIKSHA (Tree of Heaven). Coconut is a source of food, beverage, medicine, natural fiber, fuel, wood and raw materials for units producing a variety of goods. Coconut is also interlinked with socio economic life of large number of small and marginal farmers in the peninsular India. It is estimated that about 12 million people in India are dependent on the coconut sector in areas of cultivation, processing and trading activities. With an annual production of around 17,000 million nuts, coconut contribution to nation’s GDP is about 15,000 crores rupees.

The official statistics on area and production of coconut is released by the Directorate of Economics and Statistics (DES) in Kerala, Tamil Nadu, Karnataka and Andhra Pradesh. In other states like Maharashtra, Gujarat, Odisha and UTs coconut production estimation is exercised by Agriculture or Horticulture Department of State Governments. The All India final estimate of area and production of coconut were officially released by the Directorate of Economics and Statistics under the Ministry of Agriculture & Cooperation, Government of India until 2008-09. Thereafter the mandate was shifted to the Horticulture Division under the Ministry of Agriculture, Government of India.

It is observed that the release of official data by the State DES/Agri/ Hort Departments has a two years lag. Whereas, availability of concurrent data on coconut production is critical for informed decision making on many policy issues related to the crop and its development programmes including declaration of Minimum Support Price fixation. Hence it was felt appropriate to have a concurrent estimation of coconut production by the Coconut Development Board itself. Further the Board has been advised by the Ministry of Agriculture for undertaking an advance production estimation of coconut. Accordingly Coconut Development Board took a decision in its 111th Board meeting held on 15.09.2012 for undertaking a production estimation survey in 31 major coconut growing districts of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh for the agriculture year 2012-13.

1.2 Objective

- To estimate concurrent production and yield of coconut in four major southern states including Andhra Pradesh for 2012-13.
- To develop a scientific model for predicting the coconut production in the country 6-10 months in advance.
1.3 Coverage

Of the 23 districts in Andhra Pradesh, coconut cultivation is mainly there only in 10 districts, of which based on the area under coconut cultivation, major 3 districts were selected. The districts selected, and sample area covered is given in the table below:

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Districts</th>
<th>Area under Coconut cultivation(Ha)</th>
<th>Sample Area (Ha)</th>
<th>Percentage of area covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>West Godavari</td>
<td>20551</td>
<td>167.84</td>
<td>0.82</td>
</tr>
<tr>
<td>2</td>
<td>East Godavari</td>
<td>50741</td>
<td>479.26</td>
<td>0.94</td>
</tr>
<tr>
<td>3</td>
<td>Srikakulam</td>
<td>14636</td>
<td>174.82</td>
<td>1.19</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>85928</td>
<td>821.92</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Source: DES Andhra Pradesh 2011-12data, survey data - sample area

1.4 Sampling Design

Multistage sampling method is used for the selection of holdings/gardens for collecting the primary data. District is selected based on area under coconut cultivation . Minimum area cut off for selecting a district in the state was 14000 ha. Villages were selected based on statistical sampling technique; from each village, 10 holdings having minimum of 40 bearing palms were selected. For yield estimation from each holding, 10 palms are selected at random and bunch wise yield data was recorded.
1.5 Sample Size

Total area under coconut cultivation in the 3 districts is about 85928 ha according to DES Andhra Pradesh 2011-12 results. Out of which the sample area covered under the survey is 821.92 ha. In total, 5130 palms were surveyed and average holding size in the district is 1.60 ha according to the survey.

<table>
<thead>
<tr>
<th>SI No</th>
<th>Districts</th>
<th>Number of holdings</th>
<th>Total number of palms surveyed</th>
<th>Average holding size(in ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>West Godavari</td>
<td>123</td>
<td>1230</td>
<td>1.36</td>
</tr>
<tr>
<td>2</td>
<td>East Godavari</td>
<td>305</td>
<td>3050</td>
<td>1.57</td>
</tr>
<tr>
<td>3</td>
<td>Srikakulam</td>
<td>85</td>
<td>850</td>
<td>2.06</td>
</tr>
<tr>
<td></td>
<td>Andhra Pradesh</td>
<td>513</td>
<td>5130</td>
<td>1.60</td>
</tr>
</tbody>
</table>

Table 1.5: Districtwise details of Holdings selected and Average holding size

Chart 1- District wise Average size of holdings

![Chart 1- District wise Average size of holdings](chart1)
Chart 2 – District wise distribution of holdings selected for the survey

- W. Godavari: 123
- E. Godavari: 305
- Srikakulam: 85

No: of Holdings
1. **West Godavari**

West Godavari which lies in the delta region of Krishna and Godavari rivers consisting of 46 mandals constitutes for 20% (20551 ha) of total area (103967 ha) under coconut cultivation in the state. 4 mandals were selected for the survey purpose based on the area under coconut cultivation.

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Mandals</th>
<th>No: of Holdings</th>
<th>No: of Palms Surveyed</th>
<th>Sample area (in ha)</th>
<th>Avg holding size (in Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Narasapur</td>
<td>30</td>
<td>300</td>
<td>51.71</td>
<td>1.72</td>
</tr>
<tr>
<td>2</td>
<td>Mogaltur</td>
<td>20</td>
<td>200</td>
<td>37.87</td>
<td>1.89</td>
</tr>
<tr>
<td>3</td>
<td>Elamanchili</td>
<td>43</td>
<td>430</td>
<td>54.15</td>
<td>1.26</td>
</tr>
<tr>
<td>4</td>
<td>Achanta</td>
<td>30</td>
<td>300</td>
<td>24.11</td>
<td>0.80</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>123</strong></td>
<td><strong>1230</strong></td>
<td></td>
<td><strong>167.84</strong></td>
<td><strong>1.36</strong></td>
</tr>
</tbody>
</table>
2. **East Godavari**

East Godavari also known as another kerala for its lush green paddy fields and coconut groves constitutes 49% (50741 ha) of total area under coconut cultivation (103967 ha) in the state. It occupying the largest part of the rich Godavari delta comprises of 60 mandals, from which 10 were selected for the purpose of conducting the survey.

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Mandals</th>
<th>No: of Holdings</th>
<th>No: of Palms Surveyed</th>
<th>Sample area (in ha)</th>
<th>Avg holding size (in Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Atreyapuram</td>
<td>20</td>
<td>200</td>
<td>36.42</td>
<td>1.82</td>
</tr>
<tr>
<td>2</td>
<td>Ravulapalem</td>
<td>21</td>
<td>210</td>
<td>23.27</td>
<td>1.11</td>
</tr>
<tr>
<td>3</td>
<td>Kothapeta</td>
<td>33</td>
<td>330</td>
<td>41.68</td>
<td>1.26</td>
</tr>
<tr>
<td>4</td>
<td>P.Gannavaram</td>
<td>35</td>
<td>350</td>
<td>44.24</td>
<td>1.26</td>
</tr>
<tr>
<td>5</td>
<td>Ambajipeta</td>
<td>41</td>
<td>410</td>
<td>76.49</td>
<td>1.87</td>
</tr>
<tr>
<td>6</td>
<td>Ainavilli</td>
<td>30</td>
<td>300</td>
<td>48.04</td>
<td>1.60</td>
</tr>
<tr>
<td>7</td>
<td>Mummidivaram</td>
<td>30</td>
<td>300</td>
<td>40.59</td>
<td>1.35</td>
</tr>
<tr>
<td>8</td>
<td>Amalapuram</td>
<td>40</td>
<td>400</td>
<td>70.21</td>
<td>1.76</td>
</tr>
<tr>
<td>9</td>
<td>Allavaram</td>
<td>29</td>
<td>290</td>
<td>54.51</td>
<td>1.88</td>
</tr>
<tr>
<td>10</td>
<td>Razole</td>
<td>26</td>
<td>260</td>
<td>43.81</td>
<td>1.69</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>305</strong></td>
<td><strong>3050</strong></td>
<td><strong>479.26</strong></td>
<td><strong>1.57</strong></td>
</tr>
</tbody>
</table>
3. Srikakulam

Area under coconut cultivation in Srikakulam constitutes to 14% (14636Ha) of total area (103967ha) under coconut cultivation in the state. Out of the 38 mandals in Srikakulam, 3 mandals were selected based on the area under coconut cultivation for the survey purpose.

<table>
<thead>
<tr>
<th>Si No:</th>
<th>Mandals</th>
<th>No: of Holdings</th>
<th>No: of Palms Surveyed</th>
<th>Sample area (in ha)</th>
<th>Avg holding size (in Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kaviti</td>
<td>30</td>
<td>300</td>
<td>69.4</td>
<td>2.31</td>
</tr>
<tr>
<td>2</td>
<td>Kanchili</td>
<td>30</td>
<td>300</td>
<td>57.87</td>
<td>1.93</td>
</tr>
<tr>
<td>3</td>
<td>Sompeta</td>
<td>25</td>
<td>250</td>
<td>47.55</td>
<td>1.90</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>85</td>
<td>850</td>
<td>174.82</td>
<td>2.06</td>
</tr>
</tbody>
</table>

1.6 Period of Survey

The survey started in Andhra Pradesh during the month of February.
2 Methodology

For the estimation survey of coconut production in Andhra Pradesh, 3 major districts were selected based on the extent of area under coconut cultivation. From each identified districts, selection of blocks were made on the basis of statistical sampling techniques. From each block, selection of Grama panchayat was done on the basis of accepted scientific sampling norms for selecting the holdings. From each panchayat, 10 holdings having minimum 40 bearing palms is selected randomly for collection of data. From these, 10 palms are selected at random. From the selected palms, all bunches carrying developing nuts after fertilization i.e three months and above will be identified and serially numbered and number of nuts in each bunch is recorded.

Properly structured formats were used by field investigators for collection of primary data. Part A meant for geographical information of the holdings surveyed, part B the details of coconut farmer, part C information about coconut holdings and part D meant for specific yield details of the selected palms.

3 Survey Results & Analysis

3.1 Concept and Definitions

The main purpose of analysis of data is to arrive at estimate of yield and production per palm and per hectare basis which is required for estimating production with a reasonable degree of accuracy. Estimate of production can be obtained according to different concepts used which are

1. *Yielding palms*: Coconut palms which have attained fruit bearing stage at the time of enumeration are classified as yielding palms.

2. *Non- Yielding palms*: Coconut palms which have not attained nut bearing stage at the time of enumeration and coconut palms which have reached bearing stage but not bearing due to reasons like sterility, disease, old age etc. are classified as non-bearing palms.

3. *Yield*: A measurement of output obtained or harvested per tree or a unit of land area.

4. *Plant Density*: The number of plants standing within a given unit of area (here the unit area taken is Ha).

5. *Yielding Plant Density*: The number of Yielding plants within a given unit of area (here the unit area is taken Ha).
3.2 Formulae

1) Average yield per palm = \frac{\text{Total number of coconut nuts obtained in a year (Count)}}{\text{Total number of yielding coconut palms (Count)}}

2) Average plant density = \frac{\text{Total number of coconut palms (Count)}}{\text{Coconut cultivated area (Ha)}}

3) Area yielding palm density = \frac{\text{Total number of coconut palms (Count)}}{\text{Yielding coconut area (Ha)}}

4) Average holding size = \frac{\text{Total coconut cultivated area (Ha) covered in the sampling area}}{\text{Total No of holdings (Count) in the sampling area}}

5) Average yield /ha = \frac{\text{Average per palm yield}}{\text{yielding palm density /ha}}

3.3 Distribution of Holding Size

The total area surveyed in the state is 821.92 ha. The number of holdings surveyed in the state is 513 spread across 17 mandals and yield observed was of 5130 palms.

3.4 Plant Density, of Bearing & Non Bearing Palms

The most important management tool in achieving optimal overall productivity is coconut spacing that is expressed as the planting density per unit area. 175 palms per ha is considered as the optimum palm density. The survey revealed that the plant density in the state varies from 142 palms/Ha, the lowest at Srikakulam to 168 palms /Ha in W.Godavari. Density of yielding palms varies from 95 to 151 palms. Table 3.2 shows the details of palm density for the surveyed districts.

Table 3.4

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Districts</th>
<th>Palm Density/Ha</th>
<th>Bearing Palm Density (Palms/Ha)</th>
<th>Bearing Palms</th>
<th>Non bearing Palms</th>
<th>% of Bearing Palms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>W.Godavari</td>
<td>168</td>
<td>145</td>
<td>24331</td>
<td>3826</td>
<td>86%</td>
</tr>
<tr>
<td>2</td>
<td>E.Godavari</td>
<td>163</td>
<td>151</td>
<td>72604</td>
<td>5702</td>
<td>93%</td>
</tr>
<tr>
<td>3</td>
<td>Srikakulam</td>
<td>142</td>
<td>95</td>
<td>16590</td>
<td>8235</td>
<td>67%</td>
</tr>
<tr>
<td></td>
<td>State</td>
<td>160</td>
<td>138</td>
<td>113525</td>
<td>17763</td>
<td>86%</td>
</tr>
</tbody>
</table>
3.5 Yield – Palm wise and per Hectare

The table shows the per palm yield and per hectare yield obtained from the survey.

Table 3.5.1

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Districts</th>
<th>Bearing Palms</th>
<th>Yield /Palm</th>
<th>Yield / Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>W. Godavari</td>
<td>24331</td>
<td>30</td>
<td>4350</td>
</tr>
<tr>
<td>2</td>
<td>E. Godavari</td>
<td>72604</td>
<td>37</td>
<td>5587</td>
</tr>
<tr>
<td>3</td>
<td>Srikakulam</td>
<td>16590</td>
<td>17</td>
<td>1615</td>
</tr>
</tbody>
</table>

Chart 4 Yield / Ha for the surveyed districts
<table>
<thead>
<tr>
<th>Districts</th>
<th>Estimated Pdn in Lakh nuts (2012-13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W.Godavari</td>
<td>894</td>
</tr>
<tr>
<td>E.Godavari</td>
<td>2835</td>
</tr>
<tr>
<td>Srikakulam</td>
<td>236</td>
</tr>
<tr>
<td>Surveyed Districts</td>
<td>3965</td>
</tr>
<tr>
<td>Non Surveyed Districts</td>
<td>832</td>
</tr>
<tr>
<td>STATE</td>
<td>4798</td>
</tr>
</tbody>
</table>

Chart 5 Estimated Coconut Production in lakh nuts for the year 2012-13
4 Findings at a Glance

- The survey estimates per palm yield for the Andhra Pradesh state is at 28 nuts for 2012-13
- The average yield per hectare is estimated at 4615 nuts for 2012-13
- Total coconut production is estimated for the state at 4798 lakh nuts for 2012-13
- Coconut production has decreased in Andhra Pradesh (2012-13) over the previous year by 66%.

<table>
<thead>
<tr>
<th>Findings At A Glance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Districts Selected for the Survey</td>
</tr>
<tr>
<td>Number of Mandals Selected for the Survey</td>
</tr>
<tr>
<td>Total Sample Area Covered</td>
</tr>
<tr>
<td>Total Number of Holdings</td>
</tr>
<tr>
<td>Average Holding Size</td>
</tr>
<tr>
<td>Total Number of Palms Surveyed</td>
</tr>
<tr>
<td>Yield /Palm</td>
</tr>
<tr>
<td>Yield /Hectare -2012-13</td>
</tr>
<tr>
<td>Estimated Production for the year 2012-13</td>
</tr>
</tbody>
</table>
## 5 Data Tables

### Table 5.1

<table>
<thead>
<tr>
<th>Sl No:</th>
<th>Districts</th>
<th>Area in Ha</th>
<th>Production in Lakh Nuts</th>
<th>Productivity (Nuts/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>East Godavari</td>
<td>50741</td>
<td>7199.61</td>
<td>14189</td>
</tr>
<tr>
<td>2</td>
<td>West Godavari</td>
<td>20551</td>
<td>3434.23</td>
<td>16711</td>
</tr>
<tr>
<td>3</td>
<td>Srikakulam</td>
<td>14636</td>
<td>1696.97</td>
<td>11594</td>
</tr>
<tr>
<td>4</td>
<td>Visakapatnam</td>
<td>7054</td>
<td>722.95</td>
<td>10249</td>
</tr>
<tr>
<td>5</td>
<td>Chittoor</td>
<td>3663</td>
<td>293.77</td>
<td>8020</td>
</tr>
<tr>
<td>6</td>
<td>Vizianagaram</td>
<td>2689</td>
<td>376.57</td>
<td>14004</td>
</tr>
<tr>
<td>7</td>
<td>Krishna</td>
<td>1965</td>
<td>275.13</td>
<td>14002</td>
</tr>
<tr>
<td>8</td>
<td>Anantapur</td>
<td>895</td>
<td>71.65</td>
<td>8006</td>
</tr>
<tr>
<td>9</td>
<td>Nellore</td>
<td>769</td>
<td>107.7</td>
<td>14005</td>
</tr>
<tr>
<td>10</td>
<td>Khamam</td>
<td>675</td>
<td>92.6</td>
<td>13719</td>
</tr>
<tr>
<td>11</td>
<td>Cuddapah</td>
<td>132</td>
<td>10.56</td>
<td>8000</td>
</tr>
<tr>
<td>12</td>
<td>Guntur</td>
<td>125</td>
<td>17.58</td>
<td>14064</td>
</tr>
<tr>
<td>13</td>
<td>Prakasam</td>
<td>47</td>
<td>6.55</td>
<td>13936</td>
</tr>
<tr>
<td>14</td>
<td>Kurnool</td>
<td>15</td>
<td>1.19</td>
<td>7933</td>
</tr>
<tr>
<td>15</td>
<td>Mahabubnagar</td>
<td>4</td>
<td>0.58</td>
<td>14500</td>
</tr>
<tr>
<td>16</td>
<td>Nalgonda</td>
<td>3</td>
<td>0.44</td>
<td>14667</td>
</tr>
<tr>
<td>17</td>
<td>Nizamabad</td>
<td>2</td>
<td>0.29</td>
<td>14500</td>
</tr>
<tr>
<td>18</td>
<td>Ranga Reddy</td>
<td>1</td>
<td>0.15</td>
<td>15000</td>
</tr>
<tr>
<td>19</td>
<td>Adilabad</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>Hyderabad</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21</td>
<td>Karimnagar</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>22</td>
<td>Medak</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>Warangal</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>State</td>
<td></td>
<td>103967</td>
<td>14308.52</td>
<td>13763</td>
</tr>
</tbody>
</table>

Source: DES, Andhra Pradesh
### Table

#### 5.2 AREA AND PRODUCTION DATA OF COCONUT

<table>
<thead>
<tr>
<th>Sl No:</th>
<th>STATES</th>
<th>Area &quot;000&quot; ha</th>
<th>% Share in Area</th>
<th>Production &quot;000&quot; MT</th>
<th>% Share in Production</th>
<th>Pdn Million nuts</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Andaman &amp; Nicobar Islands</td>
<td>21.7</td>
<td>1.1%</td>
<td>65.4</td>
<td>0.6%</td>
<td>102</td>
<td>4711</td>
</tr>
<tr>
<td>2</td>
<td>Andhra Pradesh</td>
<td>104</td>
<td>5.5%</td>
<td>667</td>
<td>6.2%</td>
<td>1043</td>
<td>10024</td>
</tr>
<tr>
<td>3</td>
<td>Assam</td>
<td>18.8</td>
<td>1.0%</td>
<td>101</td>
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<td>158</td>
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Source: Advisor, Horticulture Division, Ministry of Agriculture, Government of India.
6 References

1. Survey report for W. Godavari district by Dr. S.Teki
2. Survey report for E.Godavari district by Dr. S.Teki
3. Survey report for Srikakulam district by Dr. S. Teki
4. Data entry done on Coconut Development Board website

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